



## Co-Evolution of an Operational Disease Reporting System, as the Standards Evolve

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- History of vCMR
- Original configuration
- Evolving configuration
- GUI screen shots
- Evolving standards
- NEDSS feasibility study
- Modifying the system
- Specific modifications
- Sample RIM message
- Other modifications
- Future directions
- Suggested PHIN updates



- Concept 1996
- Project manager 1997
- Software developer selected 1997
- Contract signed 1998
- Development and testing 1999
- Live operation 5-2000
- Alerting module 4-2001
- Lab interface live 2-2002
- Other disease programs 4-2002
- Web-CMR 5-2002



- Client-server software
- Object-oriented database with relational views
- Integrated three communicable disease data systems
  - Disease cases (80+ conditions)
  - Outbreaks
  - Foodborne illness reports
- Converted 10 years of historical data



- Electronic lab reporting
  - LOINC coding
  - SNOMED coding
- Web
  - Browser-based case submission
- Security
  - Two-factor authentication



# Electronic Lab Report Import

2nd PHIN  
Stakeholders  
Conference

**+ Visual CMR**  
File Edit Tools Windows Help

Current Domain: **VisualICMR**

**+ Disease Incident Staging**

| Imported Results |              |            |           |               |          |                     |
|------------------|--------------|------------|-----------|---------------|----------|---------------------|
| Received         | Patient      | DOB        | City      | Resulted Test | Value    | VCMR Diagnosis      |
| 05/11/2004       | REED, PAUL G | 08/01/1930 | SAN PEDRO | HCV AB        | REACTIVE | HEPATITIS C CARRIER |

**Report Preview**  
Tuesday, May 11, 2004  
LAB REPORT  
04:37 PM  
Order Status: **Final**

**KAISER PERMANENTE**  
PHYSICIAN'S LOCATION  
101 HARBOR CITY MED IP  
CA  
Sherman Way Lab - Lab Director: M. O'Connell, M.D.  
11668 Sherman Way  
North Hollywood, CA 91605  
(818) 503-6700  
PATIENT'S ADDRESS  
847 W 18TH ST #5  
SAN PEDRO, CA 90731

|   |                            |                                       |                    |
|---|----------------------------|---------------------------------------|--------------------|
| ACCESSION#<br><b>3523355912</b>         |                            | ACCOUNT#<br><b>05D0698400</b>         |                    |
| PATIENT NAME<br><b>REED, PAUL G</b>     |                            |                                       |                    |
| PATIENT ID#<br><b>81036</b>             | D.O.B<br><b>08/01/1930</b> | AGE<br><b>73 Years</b>                | GENDER<br><b>M</b> |
| PATIENT PHONE#<br><b>(310)555-1803</b>  |                            | WORK PHONE#<br><b>(000)000-0000</b>   |                    |
| REFERRING PHYSICIAN<br><b>TRAN, CHI</b> |                            |                                       |                    |
| PHYSICIAN'S PHONE#                      |                            | DRAWN<br><b>05/06/2004 5:15 AM</b>    |                    |
| LAB ORDER#<br><b>3523355912</b>         |                            | REPORTED<br><b>05/07/2004 4:25 PM</b> |                    |

**TESTS ORDERED: HEPATITIS C VIRUS ANTIBODY**  

| Result Name                | Normal | Abnormal          | Reference Range |
|----------------------------|--------|-------------------|-----------------|
| HEPATITIS C VIRUS ANTIBODY |        |                   |                 |
| <b>HCV AB</b>              |        | <b>REACTIVE A</b> |                 |

Import C  
☐ Only  
☒ Match

Delete

**ZOOM** 79

Page: 1 of 1  
Print  
OK

5/11/2004 4:37 PM  
Exit



Page 7



# Web CMR Entry Screen – Top

Visual CMR - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Mail Print Mailbox Links

**VISUAL CMR** Department of Health Services

>>> Incidents Reports My Account Logout

County of Los Angeles | Logged in as: Russell Blank | Domain: Visual CMR

### CONFIDENTIAL MORBIDITY REPORT

Note: Not intended for reporting STD, AIDS, or TB. Please see comments.

Required fields are in red.

DISEASE BEING REPORTED AMEBIASIS District (Internal) OUT OF COUNTY (non-L)

| Patient Information  |                         |  | Auxiliary Information                              |
|--|-------------------------|--|--|
| Last Name  | First Name              | Middle   | Process Status:                                    |
| ABARCAR  | SMITTY                  |  | Open   |
| SSN# (XXX-XX-XXXX)   | DOB (MM/DD/YYYY)        | Age  | Resolution Status:                                 |
|  | 5/19/1999               | 4  | Suspect  |
| Address Number & Street  | Apartment/Unit Number   |  | Transmission Status:                               |
| 925 AZUSA AVE  |                         |  |  |
| City/Town  | State                   | Zip Code   |  |
|  | CA                      |  |  |
| Home Telephone   | Work Telephone          | Gender   | Reporting Source:                                  |
|  |                         | <input checked="" type="radio"/> Male <input type="radio"/> Female | Test Care Center<br>123 Test Drive<br>Calabasas CA |
| Pregnant?  | Estimated Delivery Date |  | Tel: 818-340-7080                                  |
| <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown |                         |  | Fax: 818-340-7081                                  |
| Ethnicity  | Race                    | Secondary Race (optional)  | Submitted By: Johnny Smity                         |
| Non-Hispanic/Non-Latin   | OTHER                   |  | Submitted On: 11/02/2003                           |
| Occupation or Setting  |                         |  |  |
| Other  |                         |  |  |

Done Local intranet





# Web CMR Entry Screen – Bottom

Visual CMR - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Print Mail News RSS Feeds Links

Home Telephone:  Work Telephone:  Gender: ☒ Male ☐ Female

Pregnant?: ☐ Yes ☐ No ☐ Unknown Estimated Delivery Date:

Ethnicity: Non-Hispanic/Non-Latin Race: OTHER Secondary Race (optional):

Occupation or Setting: Other

Reporting Source:  
Test Care Center  
123 Test Drive  
Calabasas CA  
Tel: 818-340-7080  
Fax: 818-340-7081  
Submitted By: Johnny Smity  
Submitted On: 11/02/2003

**Incident Information**

Date of Onset (MM/DD/YYYY): 11/6/2003

Date of Diagnosis (MM/DD/YYYY): 11/6/2003

Date of Death (MM/DD/YYYY):

REMARKS:

Risk Factors/Suspected Exposure Type: Mark all that apply:

☐ Blood Transfusion ☐ Needle Blood Exposure  
☐ Child Care ☐ New Type  
☐ Food and Drink ☐ Other  
☐ Foreign Travel ☐ Recreational Water Exposure  
☐ Household Exposure ☐ Sexual Contact  
☐ IV Drugs ☐ Unknown

Type of Diagnostic Specimen: Mark all that apply:

☐ Blood ☐ Other  
☐ Clinical ☐ Stool  
☐ CSF ☐ Urine

SUBMIT

Done Local intranet



- SNOMED 1975
- HL7 1979+
- LOINC 1995
- NEDSS 1999
- PHIN 2003
  - Initially PHIN focused on requiring a particular database, schema, and internal tools
  - Recent evolution towards compliant services and messages using standard vocabularies



- The currently deployed version of vCMR was analyzed for PHIN compliance
- 48 unique requirements were derived from analyzing the 9 PHIN Technical Specifications
- 39 of the 48 requirements apply to vCMR
  - 29 of 39 are fully met 75%
  - 4 of 39 are partially met 10%
  - 6 of 39 may need new software 15%
- How to close the gap
  - Need CDC clarification of certain requirements
  - Await HL7 message specification completion
  - Add existing modules from the current developer
  - Modify the system with new development



- Akin to retooling the engine while the automobile is driving down the road at 65 MPH
- This system has been in full live operation for four years, and daily serves a population of 10 million people.
- It is critically important to NOT disrupt the routine operation of the working system, while enhancements are being incorporated
- Priority is on adding new capabilities, rather than preoccupation with reworking existing capabilities



- Supporting all functionality through the web interface
- Support for additional program areas: TB, HIV, injury and violence prevention, lead, toxic epidemiology
- Automatic transfer of case report information from physician's office practice management system, into vCMR
- Increase capability for XML-based secure data exchange with public health partners (example follows)



| Sample VCMR HL7 RIM PH XML Message  | Data Source Metadata Path  |
|---|--|
| <component>   |  |
| <component>   |  |
| <observationProcess>  |  |
| <id root="2.16.840.1.113883.19.6.000000" extension="DI-1477" displayable="true" />  | IN_DiseaseIncident.DI_CMRRecord  |
| <code code="PbAct" codeSystem="2.16.840.1.113883.4" codeSystemName="ActCode" displayName="PbAct.Observation" />   | In_DiseaseIncident.DI_DiseaseDR → In_DiseaseIncident.DI_DateSubmitted  |
| <text>Patient positive for disease: A/H1 = AFRICAN HEMORRHAGIC FEVER</text>   | IN_DiseaseIncident.DI_DateClosed   |
| <effectiveTime>   |  |
| <low value="20031215" inclusive="true" />   |  |
| <high value="true" inclusive="true" />  |  |
| <effectiveTime>   |  |
| <activityTime>  |  |
| <low value="20031215" inclusive="true" />   | IN_DiseaseIncident.DI_DateSubmitted  |
| <high value="true" inclusive="true" />  | IN_DiseaseIncident.DI_DateClosed   |
| <activityTime>  |  |
| <value code="x8070" codeSystem="2.16.840.1.113883.6.5" codeSystemName="Systemized Nomenclature in Medicine Reference Terminology" displayName="Ebola virus infection" originalText="AFRICAN HEMORRHAGIC FEVER" /> | In_DiseaseIncident.DI_DiseaseDR → DIC_Disease.DIS_SNOmedID → DIC_SNOmed_SNOID_ConditionID → DIC_SNOmed_SNOID_ConditionName |
| <interpretationCode code="A" codeSystem="2.16.840.1.113883.3" codeSystemName="ObservationInterpretation" displayName="Abnormal" />  | In_DiseaseIncident.DI_DiseaseDR  |
| <methodCode />  |  |
| <location><1> CMET COCT_MT0900000 reference suppressed (participant) -></location>  |  |
| <participant><1> CMET COCT_MT0900000 reference suppressed (assignedEntity) -></participant>   |  |
| <participantInformation>  |  |
| <sequenceNumber>  |  |
| <participantInformation>  |  |
| <observationProcess>  |  |
| <component>   |  |
| <participantInformation>  |  |
| <participantEvent>  |  |
| <participantInformation>  |  |





# HL7 RIM PH Case Message & Mapping – Details

| Sample VCMR HL7 RIM PH XML Message  | Data Source Metadata Path   |
|---|---|
| <?xml version="1.0" encoding="UTF-8" ?>   |   |
| - <PublicHealthCase xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2002/XMLSchema-instance" xsi:schemaLocation="urn:hl7-org:v3 PORR_HD100001.xsd"> |   |
| <id root="2.16.840.1.113883.19.6.000000" extension="DI-1477" displayable="true" />  | IN_DiseaseIncident.DI_CMRRecord   |
| <code code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{Ph-DiseaseNotification}" />                              | {TBD HL7 – PH Notify ActCode}   |
| <text>Web CMR Disease Incident Record DI-1477 Case Report</text>  | IN_DiseaseIncident.DI_CMRRecord   |
| <statusCode code="New" />   | IN_DiseaseIncident.DI_ProcessStatusDR → DI_IncidentProcessStatus.IPS_Status |
| - <effectiveTime>   |   |
| <low value="20031215" inclusive="true" />   | IN_DiseaseIncident.DI_DateSubmitted   |
| <high value="" inclusive="true" />  | IN_DiseaseIncident.DI_DateClosed  |
| </effectiveTime>  |   |
| - <activityTime>  |   |
| <low value="20031215" inclusive="true" />   | IN_DiseaseIncident.DI_DateSubmitted   |
| <high value="" inclusive="true" />  | IN_DiseaseIncident.DI_DateClosed  |
| </activityTime>   |   |
| - <detectionMethodCode code="{PhCode}" codeSystem="2.16.840.1.113883.5" codeSystemName="codeSysName" displayName="{Ph-DetectionMethod}">                | {TBD HL7 – PH Detect MethodCode}  |
| <originalText>Other</originalText>  | IN_DiseaseIncident.DI_ReportSourceDR → E_ReportSource.RS_Type               |
| </detectionMethodCode>  |   |
| - <author>  |   |

| Sample VCMR HL7 RIM PH XML Message  | Data Source Metadata Path  |
|---|--|
| </component1>   |  |
| - <component3>  |  |
| - <observationProcess>  |  |
| <id root="2.16.840.1.113883.19.6.000000" extension="DI-1477" displayable="true" />  | IN_DiseaseIncident.DI_CMRRecord  |
| <code code="{PhAct}" codeSystem="2.16.840.1.113883.5.4" codeSystemName="ActCode" displayName="{PhAct-Observation}" />   | {TBD HL7 – PH Observe ActCode}   |
| <text>Patient positive for disease: AHF = AFRICAN HEMORRHAGIC FEVER</text>  | In_DiseaseIncident.DI_DiseaseDR → DIC_Disease.DIS_ShortName  |
| - <effectiveTime>   | IN_DiseaseIncident.DI_DateSubmitted  |
| <low value="20031215" inclusive="true" />   | IN_DiseaseIncident.DI_DateClosed   |
| <high value="" inclusive="true" />  |  |
| </effectiveTime>  |  |
| - <activityTime>  |  |
| <low value="20031215" inclusive="true" />   | IN_DiseaseIncident.DI_DateSubmitted  |
| <high value="" inclusive="true" />  | IN_DiseaseIncident.DI_DateClosed   |
| </activityTime>   |  |
| <value code="x8070" codeSystem="2.16.840.1.113883.6.5" codeSystemName="Systemized Nomenclature in Medicine Reference Terminology" displayName="Ebola virus infection" originalText="AFRICAN HEMORRHAGIC FEVER" /> | In_DiseaseIncident.DI_DiseaseDR → DIC_Disease.DIS_SNOMEDDR → DIC_SNOMED.SNMD_ConditionID & DIC_SNOMED.SNMD_ConditionName |
| <interpretationCode code="A" codeSystem="2.16.840.1.113883.5.83" codeSystemName="ObservationInterpretation" displayName="Abnormal" />   | In_DiseaseIncident.DI_DiseaseDR  |
| <methodCode />  |  |
| <location><!-- CMET 'COCT_MT0900000' reference suppressed (participant) --></location>  |  |
| <participant><!-- CMET 'COCT_MT0900000' reference suppressed (assignedEntity) --></participant>   |  |



- Retrofitting to permit running on less capable database management systems (e.g., lacking object-orientation, namespaces, etc.)
- Migrating web tools from one platform to a more fashionable one
- Migrating to a standard interface engine platform for laboratory interfaces





- Continue to evolve as standards are clarified
- As the number of installed jurisdictions increases, more people will generate ideas to improve design.
- More fully integrate with other aspects of LA County PH architecture, including HAN (HASTEN), operational data store, data warehouse.
- Increase hospitals using web-vCMR from 8 in 2003 to 120 by 2005.
- Assist more local laboratories to develop ability to send us electronic laboratory reports



- The CDC should take an active role in defining PH related HL7 RIM codes and vocabularies, the lack of which makes PH Case message generation difficult
- The CDC should become the official registrar for OIDs to identify all public health agencies
- The CDC should assist HL7 in defining a Clinical Document Architecture template framework for public-health-specific information exchange, such as local case management
- PHIN should acknowledge the usefulness of a wider range of development and database tools than are currently endorsed in the standards